What Is Claimed Is:

1. Apparatus for cutting an aperture in a side wall of a patient's blood vessel comprising:

a tissue-piercing structure having a longitudinal axis and being configured to pierce the side wall by passing through the side wall substantially parallel to the longitudinal axis;

a plurality of resilient structures mounted on the tissue-piercing structure so that they do not substantially increase dimensions of the tissue-piercing structure transverse to the longitudinal axis as the tissue-piercing structure and the resilient structures pass through the side wall, the resilient structures being resiliently biased to spring radially outwardly from the tissue-piercing structure after the tissue-piercing structure and the resilient structures have passed through the side wall; and

a hollow annular tissue-cutter structure disposed annularly around the tissue-piercing structure and configured for movement substantially parallel to the longitudinal axis and for rotation about the longitudinal axis to produce an annular cut through the side wall and to thereby sever from the side wall a disc of tissue that was previously pierced by and that remains impaled on the tissue-piercing structure, the outwardly sprung resilient structures serving to at least help hold the disc on the tissue-piercing structure.

2. The apparatus defined in claim 1 wherein the resilient structures are mounted on the tissue-piercing structure in an array which is annular about the longitudinal axis.

3. The apparatus defined in claim 1 wherein each resilient structure is mounted on the tissue-piercing structure so that the resilient structure is resiliently deflectable substantially parallel to the longitudinal axis.

4. The apparatus defined in claim 1 wherein each resilient structure has a distal portion and a proximal portion, the distal portion being closer to an end of the tissue-piercing structure that is first to pass through the side wall, the resilient structure being secured to the tissue-piercing structure adjacent the distal portion, and the proximal portion being resiliently biased to spring radially outwardly from the tissue-piercing structure.

5. The apparatus defined in claim 1 wherein the tissue-cutter structure is mounted for movement relative to the tissue-piercing structure substantially parallel to the longitudinal axis.

6. The apparatus defined in claim 1 wherein the tissue-cutter structure is rotatable relative to the tissue-piercing structure about the longitudinal axis.

7. The apparatus defined in claim 1 wherein the tissue-cutter structure has a serrated tissue cutting edge.

8. The apparatus defined in claim 1 wherein a distal portion of the tissue-piercing structure is

configured to deflect transversely to the longitudinal axis after passing through the side wall.

9. The apparatus defined in claim 1 wherein the tissue-cutter structure is configured to cut through the side wall in the same direction that the tissue-piercing structure is configured to pierce through the side wall.

10. The apparatus defined in claim 1 wherein the tissue-cutter structure is configured to receive the disc in its hollow.

11. The apparatus defined in claim 1 wherein the tissue-cutter structure has a substantially circular tissue cutting edge.